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EXAMINER	
LLOYD, EMILY M	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/549,732	THOMAS, MATTHEW JAMES	
	Examiner	Art Unit	
	EMILY M. LLOYD	3736	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 July 2010 and 03 December 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-9 and 11-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9 and 11-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This Office Action is in response to Applicant's 15 July and 3 December 2009 amendments. The Examiner acknowledges Applicant's amendments to claims 1 and 19. Currently, claims 1-9 and 11-20 are pending.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims 1-4, 6-9, 11-13 and 15-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over the abstract of "Independent Component Analysis (ICA) for denoising EMG signal from ECG signal" (Zhi-dong) as modified by US Patent 5483970 (Rosenburg).

The abstract of Zhi-dong teaches a method of monitoring electrical muscular activity, the method incorporating the steps of: a) providing a blind signal sepatation

technique suitable for separating stationary signals (ICA), b) placing a plurality of electrodes for detection of electrical muscular activity (electrodes are inherently required to obtain ECG and EMG signals; a plurality are required in order to be able to apply ICA), the signal electrodes being localized sufficiently such that i) their muscular signal contributions simulate a single muscular source to the blind signal separation technique (requirement for ICA to effectively work), and ii) the number of sources detected by the blind signal seqpation technique is not more than the number of signal electrode (this is another requirement for ICA to effectively work; further, as EMG and ECG are separated, it appears that two sources were detected requiring at least 2 electrodes, and it is well known in the art to use more than 2 electrodes when performing ICA); c) using a computer apparatus to apply the blind signal separation technique to digital signals derived from signals received from the signal electrodes to separate the muscular source (a computer manipulating digital signals is well known regarding ICA, as it is too complicated to reasonably be done by hand and without the processing capability of a computer; further "ICA can successfully separate the ECG signal and EMG signal"), and d) using a display device to display the separated muscular source to a user (this is obviously done as to determine if the separation of ECG and EMG signals was successful would require displaying the data to the user).

The abstract of Zhi-dong teaches an apparatus for monitoring electrical muscular activity which is partly due to a first muscular source and partly due to a second muscular source which is stationary (ECG relative to the heart), characterizese in that the apparatus incorporates: a) a first set of electrodes for detection of muscular activity

(electrodes are inherently required to obtain ECG and EMG signals; a plurality are required in order to be able to apply ICA), the first set of signal electrodes being suitable for localization sufficiently such that i) their muscular signal contributions associated with the first muscular source will simulate a single stationary source to the blind signal separation technique despite the non-stationarity of the first muscular source (the electrodes must be capable of this as a requirement for ICA to effectively work), and ii) the number of sources detected by the blind signal seqpation technique is not more than the number of signal electrode (this is another requirement for ICA to effectively work; further, as EMG and ECG are separated, it appears that two sources were detected requiring at least 2 electrodes, and it is well known in the art to use more than 2 electrodes when performing ICA); b) a second set of signal electrodes for detection of stationary muscular activity (electrodes are inherently required to obtain ECG and EMG signals; a plurality are required in order to be able to apply ICA); c) electronic signal processing circuitry for processing signals received from the first and second sets of signal electrodes in digital signals suitable for application of a computer-implemented blind signal separation technique (this is inherent in order to obtain the signals processed for the results discussed); d) computer apparatus programmed to implement a blind signal separation technique suitable for separating stationary signals (a computer manipulating digital signals is well known regarding ICA, as it is too complicated to reasonably be done by hand and without the processing capability of a computer; further "ICA can successfully separate the ECG signal and EMG signal"), and to use the technique to: i) process digital signals derived from signals received from the

first set of signal electrodes in order to separate non-stationary activity associated with the first muscular source (see abstract, especially "ICA can successfully separate the ECG signal and EMG signal"), and ii) process digital signals derived from signals received from the first and second sets of signal electrodes in order to separate stationary activity associated with the second muscular source (see abstract, especially "ICA can successfully separate the ECG signal and EMG signal") and e) a display device for displaying the separated muscular source to a user (this is obviously done as to determine if the separation of ECG and EMG signals was successful would require displaying the data to the user).

It is unclear from the abstract of Zhi-dong what muscular activity was measured, as well as if the muscular activity was at least partially due to a non-stationary muscular source. Further, the abstract of Zhi-dong does not provide the details of the electrodes with regards to their number, if they are low-noise, and if they are external.

Rosenburg teaches that the muscular activity is uterine activity (Column 7 lines 24-25) and therefore at least partially due to a non-stationary muscular source. Rosenburg also teach that a plurality of electrodes are used (Column 7 lines 24-26 and Figures 1e, 1f and 7b) and are external (Column 7 lines 24-26), and it is well known in the art to use low-noise electrodes as these would provide signals with less noise for better and easier processing.

Further, the abstract of Zhi-dong as modified by Rosenburg teach that the blidn signal separation technique is based on an algorithm of a kind known as an instantaneous algorithm and suitable for addressing blind signal separation problems

referred to as instantaneous mixing problems, the instantaneous algorithm incorporating an assumption that signals arrive synchronously at each sensor in a sensor array, wherein the instantaneous algorithm is independent component analysis (ICA) (abstract of Zhi-dong ICA).

Further, the abstract of Zhi-dong as modified by Rosenburg teach that the step of placing the signal electrodes comprises placing four or five signal electrodes at and above navel height with respect to an upright patient at positions close to the expected site of pacemaker activity (Rosenburg Figures 1e and 1f).

Further, the abstract of Zhi-dong as modified by Rosenburg teach that the signal electrodes are a first set of signal electrodes and the step of placing the signal electrodes includes placing a second set of signal electrodes upon the patient's skin in positions not localised sufficiently for their muscular signal contributions to simulate a single source to the signal separation technique, and wherein the signal separation technique employs signals derived via the first set of signal electrodes for monitoring non-stationary muscular activity and signals derived via the first and second sets of signal electrodes for monitoring stationary muscular activity (Zhi-dong and Rosenburg).

Further, the abstract of Zhi-dong as modified by Rosenburg teach that the non-stationary muscular activity is uterine activity (the EMG of Zhi-dong as modified by Rosenburg), the stationary muscular activity is cardiac activity (ECG of Zhi-dong) and the blind signal separation technique simultaneously acquires uterine activity and maternal and fetal cardiac activity (all of these signals would be acquired with the electrode placement of Rosenburg), and wherein the blind signal separation technique

acquires uterine activity, maternal muscle activity, fetal ECG and maternal ECG (all of these signals would be acquired with the electrode placement of Rosenburg).

5. Claim 5 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over the abstract of Zhi-dong as modified by Rosenburg as applied to claims 1-4, 6-9, 11-13 and 15-20 above, and further in view of "Blind Separation and Filtering Using State Space Models" (Cichocki et al.).

Zhi-dong as modified by Rosenbug do not expressly teach that the step of applying the signal separation technique applies ICA to processing data derived from signals from the signal electrodes, the data being arranged in successive overlapping blocks such that in pairs of adjacent blocks each subsequent block incorporates a proportion of the data in the respective preceding block, and a correlation scheme is applied to re-order independent sources derived in ICA processing of different blocks to correct for signal swapping. Cichocki et al. teach the use of the step of applying the signal separation technique applies ICA to processing data derived from signals from the signal electrodes, the data being arranged in successive overlapping blocks such that in pairs of adjacent blocks each subsequent block incorporates a proportion of the data in the respective preceding block, and a correlation scheme is applied to re-order independent sources derived in ICA processing of different blocks to correct for signal swapping (pages V-78 and V-79 Linear Demixing State Space Models). It would have been obvious to one having ordinary skill in the art at the time the invention was made to use such a step of applying the signal separation technique applies ICA to processing

data derived from signals from the signal electrodes, the data being arranged in successive overlapping blocks such that in pairs of adjacent blocks each subsequent block incorporates a proportion of the data in the respective preceding block, and a correlation scheme is applied to re-order independent sources derived in ICA processing of different blocks to correct for signal swapping as taught by Cichocki et al. in the invention of Zhi-dong as modified by Rosenbug to provide the predictable result of having better processed and thus more accurate signals (Cichocki et al. Abstract and Introduction second paragraph).

Response to Arguments

6. Applicant's arguments with respect to claims 1-9 and 11-20 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to EMILY M. LLOYD whose telephone number is (571)272-2951. The examiner can normally be reached on Monday through Friday 8:30 AM - 5 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Max Hindenburg can be reached on 571-272-4726. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Emily M Lloyd
Examiner
Art Unit 3736

/EML/

/Max Hindenburg/
Supervisory Patent Examiner, Art Unit 3736